Once the aerial photographs were taken, the Wheatland lab used photogrammetry software to correct for elevation changes and stitch together a highly detailed, accurate image. PHOTO COURTESY OF BARBARA WHEATLAND GEOSPATIAL PROGRAMS

UMaine lab uses high-tech surveying for Orland transfer station site

March 10, 2017 by David Roza on News

ORLAND — Transfer stations may not seem very high-tech, but late last year a University of Maine laboratory used advanced remote sensing techniques to provide an engineering firm with accurate maps of the land where a new waste transfer station will be built in Orland.

“Basically the client wanted the most up-to-date representation of what’s there on the ground,” said Dave Sandilands, a graduate student, remote sensing specialist and aerial survey pilot with the Barbara Wheatland Geospatial Programs, an Orono-based laboratory that’s part of the University of Maine’s School of Forest Resources.

The Wheatland lab uses satellite and aerial photography as well as laser sensing data, geographic information systems (GIS) and other tools, such as the university’s Cessna 172, to monitor forests and conservation easements and to research the natural sciences.

“GIS and remote sensing are very big in the forest industry,” said Sandilands, who added that the technology is great for analyzing a forest’s structure and health from the air. It was not a forest that brought the town of Orland and the Wheatland lab together, though.

When the town of Orland voted last year to keep sending its trash to the Penobscot Energy Recovery Co. (PERC) plant in Orrington, it also ended a 20-year waste disposal partnership with Bucksport. The two municipalities had shared a transfer station, but since Bucksport voted to join the Municipal Review Committee (MRC)’s planned Fiberight waste disposal facility, Orland now has to build its own waste transfer station by March 31, 2018.

University of Maine graduate student Dave Sandilands flew this Cessna 172 over the Orland transfer station site to take pictures for an aerial survey. The camera is mounted in a box on the plane’s belly.
PHOTO COURTESY OF BARBARA WHEATLAND GEOSPATIAL PROGRAMS

“We thought it was a poor risk to go with MRC,” said Ed Rankin, chairman of Orland’s Board of Selectmen. Rankin said the transfer station will be built near the town’s salt shed on Gray Meadow Road.

One engineering firm bidding for the construction of Orland’s transfer station is the Lincoln-based firm Foresight Engineering, which asked the Wheatland lab to do the aerial surveying part of the project for them. An up-to-date, highly detailed set of photos would give the firm a way to accurately measure distances for clearing trees, constructing the station and anticipating where water runoff would flow.

The photos would “give them a lot more information than a road map,” Sandilands said.

In November, Sandilands took off from Bangor International Airport in the University of Maine’s Cessna and climbed to 1,200 feet, which is about the height of the Empire State Building without its antenna. From that altitude, Sandilands took hundreds of photos of the future station site from a camera mounted on the plane’s belly.

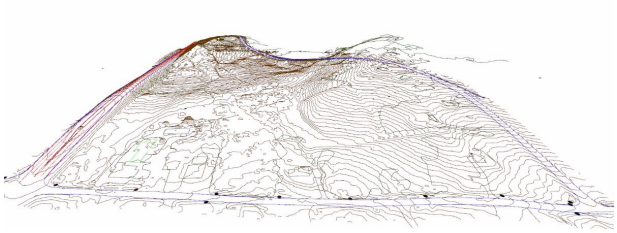
“In the realm of aerial photography that’s kind of low, which gives you pretty high resolution,” Sandilands said about the altitude. Taking photos wasn’t the end of the process, though. A flaw of aerial photography is that the photos are often distorted by changes in elevation.

Sandilands explained how if you fly over a person standing on the ground and take a picture, then fly over a person standing on a mountain and take a picture, the person on the mountain will look bigger because he or she is at a higher elevation and therefore will be closer to the camera.

Those distortions in scale make it difficult for people to use raw aerial photos for measurements. But the University of Maine lab uses photogrammetry software that takes the hundreds of photos and makes them into a correctly scaled mosaic called an orthophoto, which corrects the photographs for elevation changes.

“We use software that does all that work for us behind the scenes automatically,” Sandilands said.

Part of what allows the photogrammetry software to make changes is that it has elevation data generated using Light Detection and Ranging (LiDAR). LiDAR is a surveying method that measures the distance between objects with laser light. The laser is aimed from an aircraft-mounted sensor at the ground, and the distance between the two are measured by how long it takes for the signal to return to the sensor.



The Wheatland lab traced the outlines of roads, buildings and tree-lines and then used LiDAR data gathered by the state of Maine in 2015 to make a complete topographic map of the area. The boundaries of the map are Gray Meadows Road (right), Route 1 (left) and School House Road (bottom).
PHOTO COURTESY OF BARBARA WHEATLAND GEOSPATIAL PROGRAMS

“It creates hundreds of thousands of points per second,” Sandilands said.

The Wheatland lab used LiDAR data gathered in 2015 by the state of Maine to create a complete topographic map of the area, and correct its aerial photos for elevation change. Next, the lab outlined all of the orthophoto’s features — buildings, driveways, roads, tree lines, etc. — so that its client would have even more detail.

“You’re looking at roadway edges and people’s backyards,” Sandilands said. “There was a list of seven or eight or nine different things that we digitized by hand.”

On a map, several of those features come to life as blue lines, which indicate roads; brown lines, which indicate driveways; and green lines, which indicate tree lines. The maps and photos were then given to Foresight Engineering, though the University of Maine will still have access to what they created.

“The students can use this information that was created in-house rather than read about it in a book or article,” Sandilands said. “We can actually work with data created in the lab.”

None of the technology used to create the orthophoto is particularly new, and it is already used throughout the aerial survey industry. But this was the first time a University of Maine lab performed the whole process from start to finish.

“Usually we do bits and piece of a project,” Sandilands said. “This time we were able to go from step one to the end.”

Bio | Latest Posts

David Roza

David grew up in Washington County, Maryland, has reported in Washington County, Oregon, and now covers news in Hancock County and Washington County, Maine for *The American* and *Out & About*.